federal register

Tuesday
November 22, 1988

Part VI

Department of Transportation

Federal Aviation Administration

14 CFR Parts 21 and 36

Noise Certification Standards for Propeller-Driven Small Airplanes and Propeller-Driven Commuter Category Airplanes; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 21 and 36

[Docket No. 25034; Amendment Nos. 21-63 and 36-16]

Noise Certification Standards for Propeller-Driven Small Airplanes and Propeller-Driven Commuter Category Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule, which is based on Notice 86-10 (51 FR 25500), revises noise certification standards for propeller-driven small airplanes and propeller-driven, commuter category airplanes by substituting the use of actual takeoff tests for the level flyover tests currently specified. Subsequent to the publication of Notice 86-10, Parts 21, 23, 36, 91, and 135 of the Federal Aviation Regulations (FAR) were amended to adopt certification procedures, airworthiness and noise standards, and operating rules for an additional category of propeller-driven, multiengine airplane, designated as the Commuter Category. As a result of these amendments, propeller-driven, commuter category airplanes have been included in this final rule. This rule revises noise certification test procedures as of December 22, 1988 and revises the noise level limit numbers to approximate the sound levels measured and corrected in accordance with Appendix F of Part 36. This rule resulted from industry requests that noise certification be more directly based upon typical in-service noise measurements and from studies conducted over a three year period under the auspices of the International Civil Aviation Organization. The rule exempts both antique airplanes and airplanes modified by the addition of floats or skis from the acoustical change measurement and documentation requirements of Part 21.

DATES: Effective date of this amendment is December 22, 1988. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of December 22, 1988.

FOR FURTHER INFORMATION CONTACT: Mr. Steven Albersheim, Noise Policy and Regulatory Branch (AEE-110), Noise Abatement Division, Office of Environment and Energy, Federal Aviation Administration, 800 Independence Ave., SW., Washington, DC 20591; telephone (202) 267-3560.

SUPPLEMENTARY INFORMATION:

Synopsis of the Final Rule

Part 36 of the Federal Aviation Regulations (14 CFR Part 36) contains noise standards for aircraft type and airworthiness certification. Appendix F of Part 36 contains the provisions currently applicable to propeller-driven small airplanes and propeller-driven, commuter category airplanes. Compliance with Appendix F is now determined by a level flyover test for which the measured noise is subjected to a calculated "correction" to account for differences in aircraft performance between level flight and takeoff. This rule amends Part 36 adding an Appendix G to include actual takeoff noise tests, instead of the present level flyover test, eliminating the need for the performance correction. The amendment provides the test conditions, procedures, and noise levels necessary to demonstrate compliance with certification requirements. The new noise standard affects the following items:

A. Certification Procedure Provisions

The new rule amends FAR Part 36 by adding an Appendix G which contains the specifications for conducting takeoff noise certification tests. This appendix also contains procedures for adjusting measured noise data for the differences in aircraft performance and acoustic propagation between the test day and the reference standard day. The effective date for Appendix G is December 22, 1988.

B. Noise Level Standard

Appendix G provides for the continued use of the A-weighted sound level (L_A) as the noise measure the propeller-driven small airplanes and propeller-driven, commuter category airplanes.

The Appendix G noise level limit is simply a translation of the current Appendix F noise limit which accounts for the difference in noise level resulting from the change in test airspeed and distance that the airplane is from the microphone. Even though the Appendix G noise level limit is now 5 decibels higher than the Appendix F limit, no change in absolute noise level requirements is expected to occur from this amendment.

C. Acoustical Change

FAR Part 21 has been amended to remove the present limitations on acoustical changes. These limitations were based on the use of the level flyover test and had no provision for increased airplane weight or decreased performance. With this revision, FAR Part 21 now uses one acoustical change provision for all airplanes that are noise certificated using a takeoff test.

The revision to FAR Part 21 also exempts from the acoustical change requirements antique airplanes, i.e., those that had flight time before January 1, 1955, and airplanes modified by the addition of floats or skis. The owners of antique aircraft often experience difficulty in finding airworthy parts, e.g., engines, needed to keep aircraft in safe operable condition. They, therefore, often opt to make changes based on current parts availability and safety. The typical operator of an antique aircraft owns only one airplane and the acoustical change situations arise infrequently; thus, the FAA does not believe that adding noise requirements is justified either economically or environmentally.

Regulatory History

On December 31, 1974, the FAA adopted noise standards (40 FR 1029) for propeller-driven small airplanes, which prescribed noise standards for the issue of normal, utility, acrobatic, transport, and restricted type certificates. The rule also prescribed noise standards for airworthiness certificates and restricted category airworthiness certificates for newly produced propeller-driven small airplanes of older type designs. Finally, the rule prohibited acoustical changes in the type design of those airplanes where those changes increased noise levels beyond specified limits. Section 611 of the Federal Aviation Act of 1958 (49 U.S.C. 1431), as amended by the Noise Control Act of 1972 (Pub. L. 92-574) provided the statutory authority for the provisions published in Notice 73-26 in the **Federal Register** on October 10, 1973 (38 FR 28016). A corrective amendment was published in the **Federal Register** on February 11, 1975 (40 FR 6346). The adopted standards were again amended (41 FR 56506; December 23, 1976) as a result of two proposals submitted to the FAA by the Environmental Protection Agency (40 FR 820, January 3, 1975, and 40 FR 1061; January 6, 1975).

A further amendment (45 FR 67064, October 9, 1980) applied to new production of previously exempt agricultural and fire-fighting airplanes (without flight time before January 1, 1980), and to acoustically changed airplanes (without flight time in the changed configuration before January 1, 1980) that had not been shown to comply with Part 36 noise levels.

In May 1983, the International Civil Aviation Organization (ICAO) Committee on Aircraft Noise recommended replacing the ICAO

flyover noise standard with a takeoff noise standard. In July 1986, a Notice of Proposed Rulemaking (NPRM) was published in the **Federal Register** (Notice 86–10, 51 FR 25500; July 14, 1986) to solicit comments on the proposal to revise noise certification for propeller-driven small airplanes by substituting the use of actual takeoff tests for the level flyover tests specified in Appendix F of Part 36. This final rule is substantially the same as the ICAO recommendation, except for microphone placement and associated noise limits.

Need for Regulation

The noise certification method for propeller-driven small airplanes contained in Appendix F approximated the takoff noise by requiring level flyovers and making "corrections" calculated from meaured or assumed aircraft performance. However, ground measurements recorded during actual takeoffs seldom agreed with the Appendix F certification levels. As a result, the Genereal Aviation Manufacturers Association suggested that the noise certification rules should be changed to employ actual takeoff noise measurements. Thus, the purpose of this amendment is only to change the noise testing procedure and not to lower the absolute noise limitations.

Additionally, under Section 611 of the Federal Aviation Act of 1958, as amended (the Act), the FAA Administrator, in prescribing or amending aircraft noise regulations, is required to consider, among other things, whether the action is consistent with the highest degree of safety in air commerce and whether it is economically reasonable, technologically practicable, and appropriate for the particular type of aircraft to which it would apply. The FAA believes that this final rule meets the requirements of Section 611 of the Act.

Rule Structure and Timing

As a part of this rule, an Appendix G has been added to Part 36. This appendix is structured along the general lines of Appendix F which contains the requirements for noise certification of propeller-driven small airplanes and propeller-driven, commuter category airplanes using the level flyover test. While both procedures share some common elements e.g., the use of the A-weighted decibel as the unit of noise measure), their differences are so pervasive that concern for the clarity of the resulting regulation requires the use of a separate appendix.

Similarly, to preclude questions of the applicability of each procedure, the FAA will require the use of Appendix G of all tests conducted on or after December 22, 1988, regardless of the date of application for type certification. This will eliminate the regulatory burden that would be imposed on applicants if different standards and tests were required for different airplanes, or models thereof, in same product line. On or after December 22, 1988, all noise certification tests will be conducted pursuant to Appendix G.

Analysis of the Amendments

The amendment to establish a takeoff test procedure for the noise certification of propeller-driven small airplanes and propeller-driven, commuter category airplanes revises existing Parts 21 and 36 to the Federal Aviation Regulations (14 CFR Parts 21 and 36) as follows: 1. Section 21.93 defines changes to an aircraft type design which require recertification for noise, i.e., acoustical changes. Recertification for those "acoustical changes" for propeller-driven small airplanes and propeller-driven, commuter category airplanes was limited to (a) changes to or removal of mufflers of similar noise-control components or (b) increases in installed power or propeller tip speed. This amendment expands the definition of acoustic change. As amended, § 21.93 states that any voluntary change in the type design of an airplane which may increase the noise levels of that airplane is an "acoustical change". This change allow one "acoustic change" definition to be used by all airplanes.

Section 21.93 has also been amended to eliminate recertification for acoustic change for antique airplanes and land-based airplanes which only add (or substitute) floats or skis to already certificated wheeled aircraft. Recertification for acoustic change is required for acoustic changes made after a wheeled aircraft has been reconfigured with floats or skis. The new definition of "antique" airplane is limited to U.S. registered airplanes with flight time prior to January 1, 1955. As amended in this respect, § 21.93 is now consistant with § 45.22(b) which grants an exemption to antique aircraft from nationality and registration marking. There is no change in airworthiness certification requirements as a result of this rule.

2. Two additional technical publications have been incorporated by reference in § 36.6. The publications contain technical specifications for noise measurement and analysis equipment and are available from the International Electrotechnical Commission. Section 36.6 provides information concerning the purchase of these additional publications and a listing of the U.S. Government offices where the publications are available for inspection. The listing of these offices has been updated to account for changes which occurred subsequent to publication of Notice 86–10. However, this change does not effect the scope of this final rule.

3. Section 36.9 has been amended to require that noise tests conducted for acoustical changes be performed in accordance with § 36.501. At present § 36.9 requires compliance with Appendix F. However, § 36.501 directs applicants to the appropriate appendix.

4. Section 36.501 has been expanded to direct applicants for new, amended, and supplemental type certificates to the appropriate noise limit in Appendix F for certification tests completed before December 22, 1988. or Appendix G for certification tests completed on or after December 22, 1988.

5. Paragraphs (b) and (c) of § 36.501 have been amended to direct applicants for new, amended, and supplemental type certificates to the appropriate noise certification regulation. The amendment establishes Decmeber 22, 1988, as the date on or after which all noise certification tests for propeller-driven small airplanes and propeller-driven, commuter category airplanes will be conducted using the methods and procedures of Appendix G. All tests completed before this date will use Appendix F. The noise levels appropriate to each procedure are contained in the applicable appendix.

6. The title of Appendix F has been changed to clearly indicate that it only pertains to the flyover test requirements for propeller-driven small airplanes and propeller-driven, commuter category airplanes.

7. Similarly, the description of the scope of Appendix F, contained in section F36.1, has been amended to reflect its new status.

8. An Appendix G has been added to FAR Part 36 and its contents are summarized as follows:

PART A—GENERAL

The scope of Appendix G is specified in section G36.1. The appendix prescribes procedures and certification noise levels applicable to tests of propeller-driven small airplanes and propeller-driven, commuter category airplanes which are conducted on or after December 22, 1988. Tests for propeller-driven small airplanes and propeller-driven, commuter category airplanes which are conducted prior to

December 22, 1988, will be performed under Appendix F.

PART B—NOISE MEASUREMENT

Section G36.101 specifies takeoff test conditions including both the physical conditions for the noise measurement site and the meteorological "test window". The meteorological window in which testing is allowable is larger for Appendix G than for Appendix F. Specifically, temperature and relative humidity limits for Appendix G have been increased to match those currently used for testing of large propeller-driven and turbojet powered aircraft. These limits should decrease the need and costs of waiting for acceptable weather conditions before starting tests. The wind limits have been changed to include limits on both total wind and cross-wind velocity. Appendix F only has a total wind limit coupled with a requirement to align the airplane flight direction within +15 degrees of the wind under certain circumstances.

Section G36.103 describes the acoustical measurement system. Since the noise unit chosen for Appendix G is the same as that for Appendix F, no changes in this section have been made.

Section G36.105 is similar to the corresponding section of Appendix F, with some additional technical guidance provided. Specifically, two additional documents from the International Electrotechnical Commission (Publication No. 651, entitled "Sound Level Meters" and No. 561, entitled "Electro-acoustical Measuring Equipment for Aircraft Noise Certification") are incorporated by reference. A reference to the calibration procedures contained in Appendix A is also added to clarify the requirements in this area. The section adds two more categories of acceptable sound level recording instrumentation, graphic level recorders and sound level meters. These additions increase the flexibility of the rule and lower the costs to the applicant. Additionally, use of an inexpensive windscreen is required when the wind speed exceeds 5 knots. This requirement will improve the signal-to-noise ratio on windy days, improve the data, and increase the number of test days available to applicants.

Section G36.107 specifies the requirements for noise measurement procedures, including the orientation of the microphone during takeoff. The orientation of the microphone sensing elements during the test must be related to the direction from which the sound was coming during calibration. Similarly, the recorder must be calibrated within 10 decibels of the full-scale value. Both of these requirements are intended to ensure that differences between measurement systems will not affect measured sound levels.

Section G36.109 provides guidance on the types and extent of data necessary for noise certification including information on the equipment and its response, and meteorological and topography features that might affect noise measurements, aircraft performance, and noise levels. For takeoff noise tests, information must be gathered on aircraft performance and position when the airplane is directly over the microphone to make the corrections required in section G36.201.

Section G36.111 specifies airplane flight procedures with measurement distances taken from the microphone location at the noise measuring site. Specifically, the start of takeoff roll must be 8,200 feet from the noise measuring site and the aircraft must pass over it within ten degrees from the vertical and within twenty percent of the reference (standard day) altitude. The reference day is a no-wind, sea level day of 59 °F and 70 percent relative humidity. The 59 °F standard is that used for calculating aircraft performance for airworthiness certification and by using this value, rather than the 77 °F used in Appendix F, applicants need not re-compute aircraft performance solely for noise certification purposes. Such calculations are not currently necessary under Appendix F since aircraft noise during level flyover can generally be assumed to be independent of temperature.

PART C—DATA CORRECTIONS

Section G36.201 contains the technical specifications for the corrections to measured data necessary under Appendix G. Corrections are required to convert the data to standard reference conditions for (1) atmospheric absorption, (2) noise path length differences caused by conditions such as changes in altitude, (3) propeller tip speed, and (4) engine power. This section does not require correction for atmospheric absorption if the test is conducted within a "no-correction" window, shown in figure G1. A similar "no-correction" window is provided for certain tests conducted within five percent of the reference power.

Section G36.203 requires that the measurement point be overflown at least six times to get enough measurements for a statistically valid average sound level. Further, the variation of these flights must be such that the confidence limit does not exceed 1.5 dB(A).

PART D—NOISE LIMITS

The noise level limits for the takeoff tests of propeller-driven small airplanes and propeller-driven, commuter category airplanes are contained in section G36.301. The noise level must not exceed 73 dB(A) up to and including aricraft weights of 1,320 pounds. Between 1,320 pounds and 3,300 pounds, the noise limit increases linearly at a rate of 1dB(A) for each 165 pounds from 73 dB(A) to 85 dB(A). Between 3,300 pounds and 19,000 pounds, noise cannot exceed 85 dB(A). The maximum weight of the airplane at brake-release must be the maximum weight for which noise certification is requested.

These limits (and all of Appendix G) apply to tests conducted on or after December 22, 1988, for noise certification for a new, amended, or supplemental type certificate. The choice of a single date on which to apply Appendix G, is intended to provide for the smooth transition to the new test procedures and to ensure equitable treatment for all applicants.

Regulatory Impact Evaluation

The FAA conducted a detailed regulatory evaluation which is included in the regulatory docket. This evaluation reviews all changes to Parts 21 and 36. The FAA determined that the final rule is considered to be significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034; February 26, 1979) and is not major as defined in Executive Order 12291.

Little or no increase in costs will result from the proposed changes in certification procedures. Such costs, when they occur, would result from limits on future versions of existing aircraft types where those affected aircraft types demonstrate poorer-than-average climb capabilities during takeoff.

Regulatory Flexibility Determination

As detailed in the evaluation, the amendments adopted to Part 36 will not impose any new requirements on small or large entities. In fact, several amendments will reduce regulatory burdens to owners of certain airplanes (e.g., antique airplanes). The majority of changes to Part 36 are either editorial or clarifying in nature. Stringency is neither increased nor decreased. Since no substantial costs are incurred with adoption of the new amendments, it is certified under the criteria of the Regulatory Flexibility Act, the final rule will not have a significant economic

impact on a substantial number of small entities.

Evironmental Analysis

Pursuant to Department of Transportation "Policies and Procedures for Considering Environmental Impacts" (FAA Order 1050.1D), the FAA has determined that this rule will not constitute a major Federal action significantly affecting the quality of the human environment. The amendment will have no net effect on noise levels around airports, including those used exclusively for general aviation. Therefore, no environmental assessment or environmental impact statement is necessary.

Trade Impact Analysis

Little or no impact on U.S. or foreign trade will occur as a result of this amendment. The majority of changes to Part 36 are either editorial or clarifying in nature, and stringency is neither increased nor decreased. Absent the rule, U.S. propeller-driven small aircraft and propeller-driven, commuter category aircraft exports may be placed at a competitive cost disadvantage since each model would be required to be certificated to both the current Appendix F flyover test and the ICAO takeoff test. The cost of multiple certifications would result in either higher selling prices or lower profits to U.S. manufacturers.

Federalism Implications

The regulations adopted in this final rule will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government. Thus, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Discussion of Comments

Interested persons were afforded the opportunity to participate in development of this rulemaking by submitting written comments to the public regulatory docket on or before October 9, 1986. All comments received have been reviewed and duly considered in promulgating this amendment.

Nineteen public comments were received in response to the notice (Docket No. 25034). All of the comments supported the revision of noise standards for propeller-driven small airplanes by substituting the use of actual takeoff tests for the level flyover tests specified in Appendix F; however, each commenter also had specific suggestions about one or more of the FAA's proposed amendments.

The comments received in public Docket No. 25034 were grouped by broad categories of issues and are discussed below.

1. Microphone Placement

A number of commenters recommended that a ground plane microphone be used for the measurement program instead of a microphone situated four feet above ground level. The ground plane microphone was recommended for greater accuracy of measurements and for standardization with ICAO measurement procedures. One commenter suggested that some recognition, in this rule, of measurements taken concurrently with both the ground plane microphone and the four foot high microphone is necessary in order to ensure that the FAA's verification of ground plane microphone measurements will be accepted by foreign certification authorities.

After consideration of the ground plane microphone, the FAA has chosen to continue using the four foot high microphone location for several reasons. First, the four foot microphone height measures noise where people receive it. Second, since noise measurements to date have been taken using a four foot microphone height, establishing a noise limit based on ground plane microphone measurements would require the FAA to first obtain additional data using the ground plane microphone in order to establish a reference database. Third, the class of airplanes to which this rule applies often use airports where jets and other large aircraft also fly. The noise from those other aircraft is measured at four feet above ground level. Thus, there would be no way to compare the certified noise levels of different aircraft using the same airport.

To lessen the burden on U.S. manufacturers which export aircraft, the FAA will approve, upon request, supplemental measurements obtained using the ground plane microphone. Although approved by the FAA, this supplemental information will not be considered a certification unless it is approved by the civil aviation authority of the country of import.

2. Aircraft Weight

Several commenters recommended that the upper weight limit of aircraft tested under this rule be increased to comply with the ICAO standard and to be consistent with NPRM, Notice 83–17 (48 FR 52010; November 15, 1983) which contained requirements for an additional category of propeller-driven, multiengine airplane, designated as the Commuter Category. The Commuter Category applies to airplanes with a maximum seating capacity, excluding pilto seats, of 19 or less, and a maximum certificated weight of 19,000 pounds or less. The final rule for the Commuter Category airplane was adopted on January 15, 1987 (52 FR 1806). NPRM, Notice 86–10 (51 FR 25500; July 14, 1986) was published for comment before the Commuter Category final rule was adopted and only covered certification of propeller-driven small airplanes of weights up to and including 12,500 pounds. To include Commuter Category airplane noise certification in Appendix G of Part 36, the upper weight limit for testing under Appendix G has been increased to 19,000 pounds.

3. Meteorological Conditions

Several commenters were concerned with the meteorological conditions and measurement procedures necessary for compliance with Appendix G. One commenter questioned the need to apply a restriction on tests where the atmospheric absorption at 8 KHz is greater than 12 dB/100 meters since the propeller blade passing or engine firing frequencies and their harmonics rarely produce energy above 1 KHz. Another commenter recommended locating the thermometer to measure ambient temperature and the hygrometer to measure relative humidity at 4 feet above the ground to avoid the need for remote monitoring. The NPRM proposed that meteorological measurements be made between 10 feet and 33 feet of the surface. Several commenters recommended that the no-correction window for atmospheric absorption be changed to comply with the ICAO standard. The NPRM proposed a requirement for atmospheric absorption correction for noise data obtained when the temperature is outside the range of 50 to 95 degrees F (10 to 35 degress C) and/or when the relative humidity is outside the range of 45 to 95 percent. One commenter suggested that testing with a temperature inversion should be permitted if a layered atmosphere with appropriate temperature and relative humidity measurements is used.

After consideration of the technical issues involved, the FAA has determined that the rule should not include a restriction on test conditions based on the atmospheric absorption at 8 KHz. By eliminating this restriction, the temperature/relative humidity window required for testing is now the

same as the ICAO window, i.e., the ambient air temperature must be between 36 and 95 degrees F (2.2 and 35 degrees C) and relative humidity must be between 20 percent and 95 percent.

Further, for test simplification, the rule allows temperature and relative humidity measurements to be made with the thermometer and hygrometer situated between 4 feet and 33 feet of the surface instead of the NPRM measurement height of between 10 feet and 33 feet.

The no-correction window for atmospheric absorption has been modified to comply with the ICAO standard. Figure G1 contains the no-correction window for atmospheric absorption.

The correction to account for differences between the test and reference height of the airplane over the noise measuring point has been changed to that used by ICAO. The NPRM specified the correction Delta (1)=22 log (H_T/H_R), where H_T is the height of the test aircraft when directly over the noise measurement point and H_R is the reference height. The final rule requires the correction Delta (1)=20 log (H_T/H_R) be used when test day conditions are outside of those specified in the atmospheric absorption no correction window (Figure G1). Delta (1)=22 log (H_T/H_R) will only be used when test day conditions are within those specified in figure G1.

Finally, it should be noted that section G36.101 is not intended to preclude using a layered atmosphere to correct for a temperature inversion, provided the correction procedure is approved by the FAA. The rule allows as much flexibility as possible with regard to meteorological conditions. Thus, no provision was made to require that a layered atmosphere be used when testing with a temperature inversion if the inversion would not significantly alter the measured noise level of the airplane.

4. Rule Effective Date

Several comments were received regarding the effective date of the rule. Appendix G prescribes procedures and noise levels applicable to noise certification of propeller-driven small airplanes and propeller-driven, commuter category airplanes conducted on or after December 22, 1988. The comments recommended that the date of applicability for the rule be based upon the date of application for the type certificate rather than on when the airplane is tested. In addition, two comments recommended that a time period be established during which a manufacturer who fails to meet the new standard may revert to the existing standard to protect his investment. One comment stated that it was possible for an airplane to satisfy Appendix F, the existing noise certification standard, but be rendered non-compliant under Appendix G.

While recognizing the commenters' concerns about meeting Appendix G certification requirements, the intent of the FAA is to standardize the takeoff noise tests for all propeller-driven small airplanes and propeller-driven, commuter category airplanes. The criteria of Appendix G are designed so that airplanes which meet Appendix F certification requirements should also meet Appendix G requirements. Thus, the final rule requires certification to Appendix G for airplanes tested on or after December 22, 1988.

5. Acoustical Change

One comment stated that the FAA proposal to remove limitations on the definition of acoustical change for propeller-driven small airplanes and align this definition with that used by all other airplanes may impose an unnecessary burden on the manufacturers of this class of airplane. The comment went on to say that the definition of acoustical change currently in § 21.93 has considerable utility because it effectively excludes the need to retest airplanes for minor configuration changes that experience has shown do not increase (or decrease) the measured noise levels.

Section 21.93 of the FAR currently limits the definition of acoustical change for propeller-driven, commuter category airplanes and propeller-driven small airplanes in the normal, utility, acrobatic, transport, and restricted categories to the following type design changes:

(i) Any change to or removal of a muffler or other component designed for noise control.

(ii) Any change to, or installation of, a powerplant or propeller that increases maximum continuous power or thrust at sea level, or increases the propeller tip speed at that power or thrust, over that previously approved for the airplane.

The new rule defines an acoustical change as any voluntary change in the type design of an airplane that may increase the noise levels of that airplane. The FAA agrees with the intent of the comment to avoid retesting for minor configuration changes which are known not to increase the noise level and believes that the new wording more clearly meets that intent. This rule will not require testing for changes which, by past experience, have been shown not to increase noise.

6. Sound Recording

Two comments were received concerning the use of a sound level meter to record test data. Section G36.105 allows airplane noise to be recorded using a magnetic tape recorder, graphic level recorder, or sound level meter when approved by the regional certification authority. One commenter stated that the requirement in section G36.105(a) that the test data should be recorded allowing a graphic level recorder or sound level meter to be used instead of a magnetic tape recorder is inconsistent with the rest of the section. Another comment, addressing the same section, questioned why a sound level meter is acceptable if the sound must be recorded. The comment went on to say that the reading of a sound level meter may be recorded, but this does not constitute recording the noise.

Appendix G is written with the intent of allowing the greatest amount of flexibility possible in order to avoid imposing undue economic burden on any applicant. Allowing the option to use a graphic level recorder or sound level meter is done to permit certification to be accomplished as inexpensively as possible. Thus, when approved by the regional certification authority, a sound level meter, graphic level recorder, or magnetic tape recorder is acceptable for recording airplane noise.

A further clarification has been added to section G36.105 concerning the type of sound level meter to be used. The intent of the rule is to use Type 1 sound level meters, as specified in Appendix F (IEC publication 179). The NPRM specified that sound level meters must comply with International Electrotechnical Commission (IEC) Publication No. 651, entitled "Sound Level Meters." Publication No. 651 supersedes Publications 123 (1961), 179 (1965 and 1973), and 179A (1973). Although Publication 651 contains standards for Type 0,1,2, and 3 sound level meters, it does not specify the type of sound level meter to be used for noise measurement. To correct this ambiguity, section G36.105 has been revised to specify the use of Type 1 sound level meters for Appendix G noise certification.

7. Limiting Noise Value

One commenter recommended that the FAA adopt the aircraft noise limits established by ICAO for noise certification of propeller driven small airplanes.

The aircraft noise limits specified in the FAA rule are as follows. The noise

level must not exceed 73 dB(A) up to and including aircraft weights of 1,320 pounds (600 kg). For weights greater than 1,320 pounds, the limit increases at the rate of 1 dB/165 pounds (1 dB/75 kg) up to 85 dB(A) at 3,300 pounds (1,500 kg), after which it remains at 85 dB(A) up to and including 19,000 pounds (8,640 kg).

ICAO specifies a 76 dB(A) limit up to an airplane mass of 600 kg, then increasing with the logarithm of airplane mass at the rate of 9.83 dB(A) per doubling of mass until 88 dB(A) is reached, after which the limit is constant up to 9000 kg. Thus, the difference in noise limits between the FAA rule and ICAO rule is approximately 3 dB(A) throughout the range of weight values for which the rule applies.

The higher ICAO noise limits can be attributed to their use of a ground plane microphone instead of the four foot height installation. Generally, a ground plane microphone will provide a noise level several dB(A) greater than a microphone situated four feet above ground level for the same airplane. Thus, the difference in limiting noise values between the FAA rule and the ICAO rule is due to a difference in measurement technique rather than a difference in noise standards.

8. Helical Tip Mach Number Correction

One commenter recommended that, in section G36.201(d)(3), the phrase "no correction is to be made when M_t is larger than M_r" should be deleted since it might be interpreted to apply to all cases, even those for which a specific value of the constant "k" has been determined. The constant "k" is equal to the slope of the line obtained for measured values of noise level in dB(A) versus helical tip Mach number.

The FAA agrees that if a specific value of k has been determined, a correction should be allowed when the test helical tip Mach number, M_t, is larger than the reference helical tip Mach number, M_r. The NPRM phrase "no correction is to be made when M_t is larger than M_r" was meant to apply only to cases where the nominal value of k is to be used for the correction. To avoid confusion over this point, section G36.201(d)(3) has been revised as follows. The phrase "no correction is to be made when M_t is larger than M_r has been deleted. The sentence "No correction may be made using the nominal value of k when M_t is larger than M_r" has been added.

9. Noise Level vs Airplane Weight Graph

One commenter suggested including a figure showing graphically the noise level limits as a function of airplane weight. The FAA agrees that the addition of a figure showing noise limits as a function of airplane weight would simplify interpretation of the rule. Thus, figure G2 has been added to section G36.301.

10. Microphone Diameter

One commenter recommended that since the ICAO test procedure specifies that a one half inch diameter microphone be used for data measurement, a one half inch microphone diameter should be specified for the FAA rule in order to achieve better international acceptance of data measured in accordance with the FAA procedure (and of data measured using the ground plane microphone). The NPRM did not specify a microphone size required for data measurement.

The FAA does not find it necessary to specify microphone diameter for noise certification testing in accordance with Appendix G. Both ICAO and the FAA require the same microphone frequency response tolerance. Therefore, the data should be accepted internationally. The one half inch diameter microphone is required for the ground plane microphone installation and thus is only an issue when the ground plane microphone is used.

11. Altitude Tolerance

One commenter recommended that the FAA consider eliminating the requirement that the aircraft pass over the measurement point within 20 percent of the reference altitude. The commenter stated that this requirement is unnecessary since section G36.201 requires a correction to the noise level if the test altitude differs from the reference altitude.

After consideration of this comment, the FAA chose to retain the requirement that the aircraft pass over the measurement point within 20 percent of the reference altitude. This requirement is necessary due to the inaccuracy of the correction for deviations from the reference altitude and for consistency with the ICAO standard.

12. Test Flight Tolerances

In keeping with the general recommendation of most of the commenters that the FAA maintain standardization with the ICAO noise certification rule and to simplify the certification test flight procedure, the FAA has included a tolerance on the flight test speed and weight. As written, the language in the NPRM would have required each test flight to be conducted at a single precise airspeed and weight. The FAA notes that all other Part 36 flight test procedures include reasonable tolerances for the specified reference test conditions. Further, the FAA believes that such tolerances are necessary to account for pilot and meteorological variability from test to test, and for the weight of fuel burned during testing. Accordingly, the ICAO Annex 16 tolerances have been added to section G36.111(a).

List of Subjects

14 CFR Part 21

Aircraft, Aviation safety, Exports, Imports, Reporting and recordkeeping requirements.

14 CFR Part 36

Agriculture, Aircraft, Noise control.

Incorporation by Reference.

Adoption of the Amendments

Accordingly, Parts 21 and 36 of the Federal Aviation Regulations (14 CFR Parts 21 and 36) are amended as follows:

PART 21—[AMENDED]

1. The authority citation for Part 21 continues to read as follows:

Authority: 49 U.S.C. 1344, 1348(c), 1352, 1354(a), 1355, 1421 through 1431, 1502, 1651(b)(2), 42 U.S.C. 1857F–10, 4321 et seq.; E.O. 11514; 49 U.S.C. 106(g) (Revised Pub. L. 97–449, January 12, 1983).

2. Section 21.93(b)(3) is revised to read as follows:

§ 21.93 Classification of changes in type design.

* * * * *

(b) * * *

(3) Propeller driven commuter category and small airplanes in the normal, utility, acrobatic, transport, and restricted categories, except for airplanes that are:

(i) Designated for "agricultural aircraft operations" (as defined in § 137.3 of this chapter, effective January 1, 1966) to which § 36.1583 of this chapter does not apply, or

(ii) Designated for dispensing fire fighting materials to which § 36.1583 of this chapter does not apply, or

(iii) U.S. registered, and that had flight time prior to January 1, 1955 or

(iv) Land configured aircraft reconfigured with floats or skis. This reconfiguration does not permit further exception from the requirements of this section upon any acoustical change not enumerated in § 21.93(b).

* * * * *

PART 36—[AMENDED]

3. The authority citation for Part 36 continues to read as follows:

Authority: 49 U.S.C. 1344, 1348, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430, 1431(b), 1651(b)(2), 2121 through 2125; 42 U.S.C. 4321 et seq.; Sec. 124 of Pub. L. 98-473, E.O. 11514, 49 U.S.C. 106(g) (Revised Pub. L. 97-449, January 12, 1983.)

4. Section 36.6 is amended by adding paragraphs (c)(1)(iii) and (c)(1)(iv) and by revising paragraph (e)(3) to read as follows:

§ 36.6 Incorporation by reference.

* * * * *

(c) * * *

(1) * * *

(iii) IEC Publication No. 651, entitled "Sound Level Meters," first edition, dated 1979.

(iv) IEC Publication No. 561, entitled "Electro-acoustical Measuring Equipment for Aircraft Noise Certification," first edition, dated 1976.

* * * * *

(e) * * *

(3) The respective Region Headquarters of the Federal Aviation Administration as follows:

(i) New England Region Headquarters, 12 New England Executive Park, Burlington, Massachusetts 01803.

(ii) Eastern Region Headquarters, Federal Building, John F. Kennedy (JFK) International Airport, Jamaica, New York 11430.

(iii) Southern Region Headquarters, 3400 Norman Berry Drive, East Point, Georgia 30344.

(iv) Great Lakes Region Headquarters, O'Hare Lake Office Center, 2300 East Devon Avenue, Des Plaines, Illinois 60018.

(v) Central Region Headquarters, Federal Building, 601 East 12th Street, Kanasa City Missouri 64106.

(vi) Southwest Region Headquarters, 4400 Blue Mound Road, Fort Worth, Texas 76193-0000.

(vii) Northwest Mountain Region Headquarters, 17900 Pacific Highway South, Seattle, Washington 98168.

(viii) Western-Pacific Region Headquarters, 15000 Aviation Boulevard, Hawthorne, California 92007.

(ix) Alaskan Region Headquarters, 701 C Street, Anchorage, Alaska 99513.

(x) European Office Headquarters, 15, Rue de la Loi (3rd Floor), B-1040 Brussels, Belgium.

* * * * *

5. Section 36.9 is revised to read as follows:

§ 36.9 Acoustical change: Propeller-driven small airplanes and propeller-driven small category airplanes.

For propeller-driven small airplanes in the normal, utility, acrobatic, transport, and restricted categories and for propeller-driven, commuter category airplanes for which an acoustical change approval is applied for under § 21.93(b) of this chapter after January 1, 1975, the following apply:

(a) If the airplane was type certificated under this part prior to a change in type design, it may not subsequently exceed the noise limits specified in § 36.501 of this part.

(b) If the airplane was not type certificated under this part prior to a change in type design, it may not exceed the higher of the two following values:

(1) The noise limit specified in § 36.501 of this part, or

(2) The noise level created prior to the change in type design, measured and corrected as prescribed in § 36.501 of this part.

§ 36.501 [Amended]

6. Section 36.501(a)(1) is amended by changing the words "type certificate" to read "new, amended, or supplemental type certificate"; and by inserting the phrase "and propeller-driven, commuter category airplanes for which application for the issuance of a type certificate in the commuter category is made on or after January 15, 1987" after the words "October 10, 1973."

7. Sections 36.501 (b) and (c) are revised to read as follows:

§ 36.501 Noise Limits.

* * * * *

(b) For aircraft covered by this subpart for which certification tests are completed before December 22, 1988, compliance must be shown with noise levels as measured and prescribed in Parts B and C of Appendix F, or under approved equivalent procedures. It must be shown that the noise level of the airplane is no greater than the applicable limit set in Part D of Appendix F.

(c) For aircraft covered by this subpart for which certification tests are not completed before December 22, 1988, compliance must be shown with noise levels as measured and prescribed in Parts B and C of Appendix G, or under approved equivalent procedures. It must be shown that the noise level of the airplane is no greater than the applicable limits set in Part D of Appendix G.

8. The title of Appendix F of Part 36 is revised to read as follows:

Appendix F—Flyover Noise Requirements for Propeller-Driven Small Airplane and Propeller-Driven, Commuter Category Airplane Certification Tests Prior to December 22, 1988

9. Section F36.1 of Appendix F of Part 36 is revised to read as follows:

PART A—GENERAL

Section F36.1 *Scope.* This appendix prescribes noise level limits and procedures for measuring and correcting noise data for the propeller driven small airplanes specified in §§ 36.1 and 36.501(b).

10. A new Appendix G is added to Part 36 to read as follows:

Appendix G—Takeoff Noise Requirements for Propeller-Driven Small Airplane and Propeller-Driven, Commuter Category Airplane Certification Tests on or After December 22, 1988

PART A—GENERAL

Sec.

G36.1 *Scope.*

PART B—NOISE MEASUREMENT

G36.101 *General Test Conditions.*
G36.103 *Acoustical measurement system.*
G36.105 *Sensing, recording, and reproducing equipment.*
G36.107 *Noise measurement procedures.*
G36.109 *Data recording, reporting, and approval.*
G36.111 *Flight procedures.*

PART C—DATA CORRECTIONS

G36.201 *Corrections to Test Results.*
G36.203 *Validity of results.*

PART D—NOISE LIMITS

G36.301 *Aircraft Noise Limits.*

PART A—GENERAL

Section G36.1 *Scope.* This appendix prescribes limiting noise levels and procedures for measuring noise and adjusting these data to standard conditions, for propeller driven small airplanes and propeller-driven, commuter category airplanes specified in §§ 36.1 and 36.501(c).

PART B—NOISE MEASUREMENT

Sec. G36.101 *General Test Conditions.*

(a) The test area must be relatively flat terrain having no excessive sound absorption characteristics such as those caused by thick, matted, or tall grass, by shrubs, or by wooded areas. No obstructions which significantly influence the sound field from the airplane may exist within a conical space above the measurement position, the cone being defined by an axis normal to the ground and by a half-angle 75 degrees from the normal ground axis.

(b) The tests must be carried out under the following conditions:

(1) No precipitation;

(2) Ambient air temperature between 36 and 95 degrees F (2.2 and 35 degrees C);

(3) Relative humidity between 20 percent and 95 percent, inclusively;

(4) Wind speed may not exceed 10 knots (19 km/h) and cross wind may not exceed 5 knots (9 km/h), using a 30-second average;

(5) No temperature inversion or anomalous wind condition that would significantly alter the noise level of the airplane when the nose is recorded at the required measuring point, and

(6) The meteorological measurements must be made between 4 ft. (1.2 m) and 33 ft. (10 m) above ground level. If the measurement site is within 1 n.m. of an airport meteorological station, measurements from that station may be used.

(c) The flight test procedures, measuring equipment, and noise measurement procedures must be approved by the FAA.

(d) Sound pressure level data for noise evaluation purposes must be obtained with acoustical equipment that complies with section G36.103 of this appendix.

Sec. G36.103 *Acoustical Measurement System.*

The acoustical measurement system must consist of approved equipment with the following characteristics: (a) A microphone system with frequency response compatible with measurement and analysis system accuracy as prescribed in section G36.105 of this appendix.

(b) Tripods or similar microphone mountings that minimize interference with the sound being measured.

(c) Recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of section G36.105 of this appendix.

(d) Acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal must be described in terms of its average and maximum root-mean-square (rms) value for non-overload signal level.

Sec. G36.105 *Sensing, Recording, and Reproducing Equipment.*

(a) The noise produced by the airplane must be recorded. A magnetic tape recorder, graphic level recorder, or sound level meter is acceptable when approved by the regional certificating authority.

(b) The characteristics of the complete system must comply with the requirements in International Electrotechnical Commission (IEC) Publications No. 651, entitled "Sound Level Meters" and No. 561, entitled "Electro-acoustical Measuring Equipment for Aircraft Noise Certification" as incorporated by reference under § 36.6 of this part. Sound level meters must comply with requirements for Type 1 sound level meters as specified in IEC Publication No. 651.

(c) The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude must be within the tolerance limits specified in IEC Publication No. 651, over the frequency range 45 to 11,200 Hz.

(d) If equipment dynamic range limitations make it necessary, high frequency pre-emphasis must be added to the recording channel with the converse de-emphasis on playback. The pre-emphasis must be applied such that the instantaneous recorded sound pressure level of the noise signal between 800 and 11,200 Hz does not vary more than 20 dB between the maximum and minimum one-third octave bands.

(e) The output noise signal must be read through an "A" filter with dynamic characteristics designated "slow" as defined in IEC Publication No. 651. A graphic level recorder, sound level meter, or digital equivalent may be used.

(f) The equipment must be acoustically calibrated using facilities for acoustic free-field calibration and if analysis of the tape recording is requested by the Administrator, the analysis equipment shall be electronically calibrated by a method approved by the FAA. Calibrations shall be performed, as appropriate, in accordance with paragraph A36.3(e) of Appendix A of this part.

(g) A windscreen must be employed with the microphone during all measurements of aircraft noise when the wind speed is in excess of 5 knots (9 km/hr).

Sec. G36.107 *Noise Measurement Procedures.*

(a) The microphones must be oriented in a known direction so that the maximum sound received arrives as nearly as possible in the direction for which the microphones are calibrated. The microphone sensing elements must be 4 ft. (1.2m) above ground level.

(b) Immediately prior to and after each test, a recorded acoustic calibration of the system must be made in the field with an acoustic calibrator for the purposes of checking system sensitivity and providing an acoustic reference level for the analysis of the sound level data. If a tape recorder or graphic level recorder is used, the frequency response of the electrical system must be determined at a level within 10 dB of the full-scale reading used during the test, utilizing pink or pseudorandom noise.

(c) The ambient noise, including both acoustic background and electrical systems noise, must be recorded and determined in the test area with the system gain set at levels which will be used for aircraft noise measurements. If aircraft sound pressure levels do not exceed the background sound pressure levels by at least 10 dB(A), a takeoff measurement point nearer to the start of the takeoff roll must be used and the results must be adjusted to the reference measurement point by an approved method.

Sec. G36.109 *Data Recording, Reporting, and Approval.*

(a) Data representing physical measurements and adjustments to measured data must be recorded in permanent form and appended to the record, except that corrections to measurements for normal equipment response deviations need not be reported. All other adjustments must be approved. Estimates must be made of the individual errors inherent in each of the operations employed in obtaining the final data.

(b) Measured and corrected sound pressure levels obtained with equipment conforming to the specifications in section G36.105 of this appendix must be reported.

(c) The type of equipment used for measurement and analysis of all acoustical, airplane performance, and meteorological data must be reported.

(d) The following atmospheric data, measured immediately before, after, or during each test at the observation points prescribed in section G36.101 of this appendix must be reported:

(1) Ambient temperature and relative humidity.

(2) Maximum and average wind speeds and directions for each run.

(e) Comments on local topography, ground cover, and events that might interfere with sound recordings must be reported.

(f) The aircraft position relative to the takeoff reference flight path must be determined by an approved method independent of normal flight instrumentation, such as radar tracking, theodolite triangulation, or photographic scaling techniques.

(g) The following airplane information must be reported:

(1) Type, model, and serial numbers (if any) of airplanes, engines, and propellers;

(2) Any modifications or nonstandard equipment likely to affect the noise characteristics of the airplane;

(3) Maximum certificated takeoff weight;

(4) For each test flight, airspeed and ambient temperature at the flyover altitude over the measuring site determined by properly calibrated instruments;

(5) For each test flight, engine performance parameters, such as manifold pressure or power, propeller speed (rpm) and other relevant parameters. Each parameter must be determined by properly calibrated instruments. For instance, propeller RPM must be validated by an independent device accurate to within ±1 percent, when the airplane is equipped with a mechanical tachometer.

(6) Airspeed, position, and performance data necessary to make the corrections required in section G36.201 of this appendix must be recorded by an approved method when the airplane is directly over the measuring site.

Sec. G36.111 *Flight Procedures.*

(a) The noise measurement point is on the extended centerline of the runway at a distance of 8200 ft (2500 m) from the start of takeoff roll. The aircraft must pass over the measurement point within ±10 degrees from the vertical and within 20% of the reference altitude. The flight test program shall be initiated at the maximum approved takeoff weight and the weight shall be adjusted back to this maximum weight after each hour of flight time. Each flight test must be conducted at the speed for the best rate of climb (V_y) ±5 knots (±9 km/hour) indicated airspeed. All test, measurement, and data correction procedures must be approved by the FAA.

(b) The takeoff reference flight path must be calculated for the following atmospheric conditions:

(1) Sea level atmospheric pressure of 1013.25 mb (013.25 hPa);

(2) Ambient air temperature of 59°F (15°C);

(3) Relative humidity of 70 percent; and

(4) Zero wind.

(c) The takeoff reference flight path must be calculated assuming the following two segments:

(1) First segment.

(i) Takeoff power must be used from the brake release point to the point at which the height of 50 ft (15m) above the runway is reached.

(ii) A constant takeoff configuration selected by the applicant must be maintained through this segment.

(iii) The maximum weight of the airplane at brake-release must be the maximum for which noise certification is requested.

(iv) The length of this first segment must correspond to the airworthiness approved value for a takeoff on a level paved runway (or the corresponding value for seaplanes).

(2) Second segment.

(i) The beginning of the second segment corresponds to the end of the first segment.

(ii) The airplane must be in the climb configuration with landing gear up, if retractable, and flap setting corresponding to normal climb position throughout this second segment.

(iii) The airplane speed must be the speed for the best rate of climb (V_y).

(iv) Maximum continuous installed power and rpm for variable pitch propeller(s) shall be used. For fixed pitch propeller(s), the maximum power and rpm that can be delivered by the engine(s) must be maintained throughout the second segment.

PART C—DATA CORRECTIONS

Sec. G36.201. *Corrections to Test Results.*

(a) These corrections account for the effects of:

(1) Differences in atmospheric absorption of sound between meteorological test conditions and reference conditions.

(2) Differences in the noise path length between the actual airplane flight path and the reference flight path.

(3) The change in the helical tip Mach number between test and reference conditions.

(4) The change in the engine power between test and reference conditions.

(b) Atmospheric absorption correction is required for noise data obtained when the test conditions are outside those specified in Figure G1. Noise data outside the applicable range must be corrected to 77 F and 70 percent relative humidity by a FAA approved method.

(c) Helical tip Mach number and power corrections must be made if:

(1) The propeller is a variable pitch type, or

(2) The propeller is a fixed pitch type and the test power is not within 5 percent of the reference power.

(d) When the test conditions are outside those specified, corrections must be applied by an approved procedure or by the following simplified procedure:

(1) Measured sound levels must be corrected from test day meteorological conditions to reference conditions by adding an increment equal to

$$\text{Delta (M)} = (\alpha - 0.7)\, H_T/1000$$

where H_T is the height in feet of the test aircraft when directly over the noise measurement point and α is the rate of absorption for the test day conditions at 500 Hz as specified in SAE ARP 866A, entitled "Standard Values of Atmospheric Absorption as a function of Temperature and Humidity for use in Evaluating Aircraft Flyover Noise" as incorporated by reference under § 36.6 of this part.

(2) Measured sound levels in decibels must be corrected for height by algebraically adding an increment equal to Delta (1). When test day conditions are within those specified in figure G1:

$$\text{Delta (1)} = 22 \log (H_T/H_R)$$

where H_T is the height of the test aircraft when directly over the noise measurement point and H_R is the reference height.

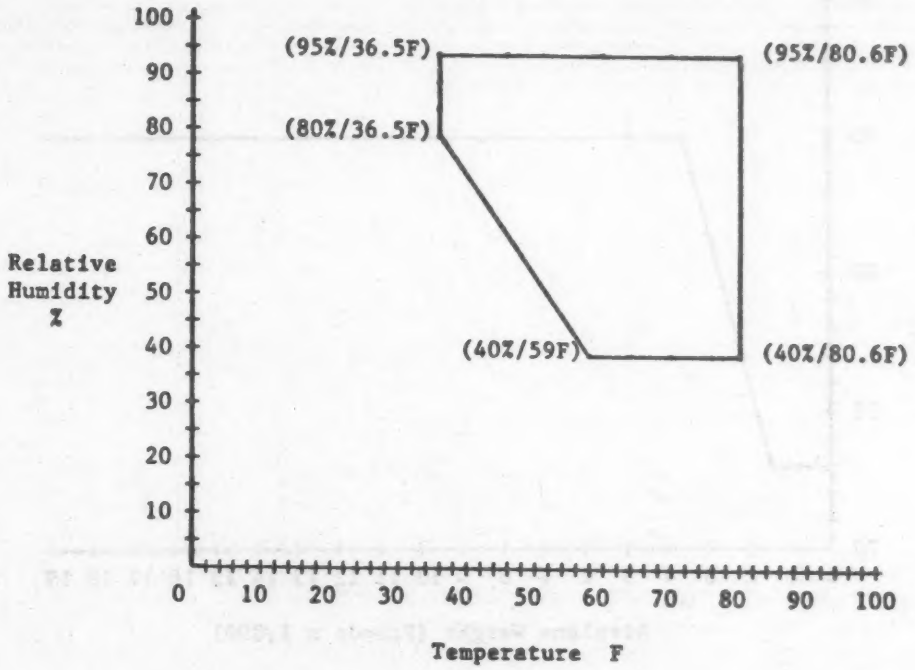
When test day conditions are outside those specified in figure G1:

$$\text{Delta (1)} = 20 \log (H_T/H_R)$$

(3) Measured sound levels in decibels must be corrected for helical tip Mach number by algebraically adding an increment equal to:

$$\text{Delta (2)} = k \log (M_R/M_T)$$

where M_T and M_R are the test and reference helical tip Mach numbers, respectively. The constant "k" is equal to the slope of the line obtained for measured values of the sound level in dB(A) versus helical tip Mach number. The value of k may be determined from approved data. A nominal value of $k = 150$ may be used when M_T is smaller than



MEASUREMENT WINDOW FOR NO ABSORPTION CORRECTION

Figure G1

M_R. No correction may be made using the nominal value of k when M_T is larger than M_R. The reference helical tip Mach number M_R is the Mach number corresponding to the reference conditions (RPM, airspeed, temperature) above the measurement point.

(4) Measured sound levels in the decibels must be corrected for engine power by algebraically adding an increment equal to:

Delta (3) = 17 log (P_R/P_T)

where P_T and P_R are the test and reference engine powers respectively.

Sec. G36.203 *Validity of Results.*

(a) The measuring point must be overflown at least six times. The test results must produce an average noise level ($L_{A,max}$) value within a 90 percent confidence limit. The average noise level is the arithmetic average of the corrected acoustical measurements for all valid test runs over the measuring point.

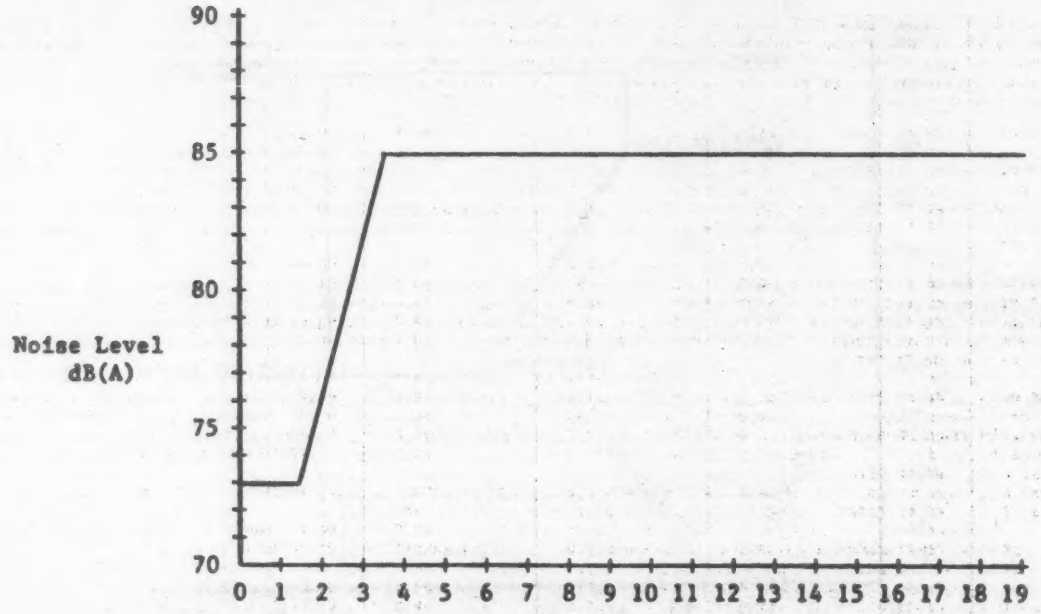
(b) The samples must be large enough to establish statistically a 90 percent confidence limit not exceeding ±1.5 dB(A). No test results may be omitted from the averaging process unless omission is approved by the FAA.

PART D—NOISE LIMITS

Sec. G36.301 *Aircraft noise limits.*

(a) Compliance with this section must be shown with noise data measured and corrected as prescribed in Parts B and C of this appendix.

(b) The noise level must not exceed 73 dB(A) up to and including aircraft weights of 1,320 pounds (600 kg). For weights greater than 1,320 pounds the limit increases at the rate of 1 dB/165



NOISE LEVEL vs AIRPLANE WEIGHT

FIGURE G2

pounds (1 dB/75 kg) up to 85 dB(A) at 3,300 pounds (1,500 kg), after which it is constant at 85 dB(A) up to and including 19,000 pounds (8,640). Figure G2 shows noise level limits vs airplane weight.

(Sec. 313(a), 603, and 611(b), Federal Aviation Act of 1958 as amended (49 U.S.C. 1354(a), 1423, and 1431(b)); sec. 6(c), Department of Transportation Act (49 U.S.C. 1655 (c)); Title I, National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*); Exceutive Order 11514, March 5, 1970 and 14 CFR 11.45).

Issued in Washington, DC, on September 23, 1988.

T. Allan McArtor,

Administrator.

FR Doc. 88-26887 Filed 11-21-88; 8:45 am]

BILLING CODE 4910-17-A